DOCUMENT RESUME

ED 300 772 CS 009 380

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TITLE The Relationship between the Learning Styles and Reading Achievement of Sixth-Grade Students in the State of Alabama.
PUB DATE Nov 88
NOTE 36p.; Paper presented at the Annual Meeting of the Mid-South Educational Research Association (17th, Louisville, KY, November 9-11, 1988).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Cognitive Style; Grade 6; Intermediate Grades; Racial Identification; *Reading Achievement; School Location; Sex Differences
IDENTIFIERS Alabama; Gregorc Style Delineator; Hunt Paragraph Completion Method; Learning Style Inventory; Learning Styles Inventory (Renzulli and Smith); Reading Style Inventory (Carbo)

ABSTRACT

To determine whether or not a statistically significant relationship existed between the learning styles and reading achievement of sixth-grade students in the State of Alabama a battery of four learning style inventories (Gregorc Style Delineator, Hunt Paragraph Completion Method, Renzulli-Smith Learning Style Inventory, and Carbo Reading Style Inventory) were administered to the students. Also, attempts were made to determine whether statistically significant relationships existed between the learning styles of students and their gender, the locations of their schools, and their racial identification. Subjects, 405 sixth-grade students representing the eight State School Board Districts in Alabama, participated in the study. In regards to these students, evidence supports the following conclusions: (1) the Gregorc Style Delineator and the Renzulli-Smith Learning Style Inventory would not be useful in making decisions; (2) the Hunt Paragraph Completion Method and the Carbo Reading Style Inventory would be useful in making decisions; and (3) the Hunt Paragraph Completion Method would be useful in identifying learning style preferences for students with low, average, and high reading achievement who prefer much or little structure in their learning environments; and (4) the Carbo Reading Style Inventory would be useful in identifying learning style preferences for students with low, average, and high reading achievement who prefer kinesthetic or auditory learning styles. (Nine tables of data are included, and 46 references are appended.) (MS)

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THE RELATIONSHIP BETWEEN THE LEARNING STYLES AND READING ACHIEVEMENT OF SIXTH-GRADE STUDENTS IN THE STATE OF ALABAMA

by

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Paper Presented at the

Annual Conference of the

Mid-South Educational Research Association

Louisville, Kentucky

November 10, 1988

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Introduction

Education is overwrought with theories and definitions for learning styles. Many theorists build upon the works of others, and, consequently, many of these theories and definitions overlap. But each researcher who develops a new theory invents new terms to give the theory an individuality which links it to its creator.

Learning styles may be defined very simply as students' preferred ways of learning. Some researchers define the term in a more complex manner. Hunt (1979), defined learning styles on the basis of the extended structure needed by students. He identified the characteristics of students requiring much, some, and less structure and also the teaching procedures that were most desirable for students requiring a certain degree of structure.

Gregorc (1979) stated that learning styles consist of "distinctive, observant behaviors which serve as indicators of how individuals learn from and adapt to their environment. It also gives clues as to how a person's mind operates" (p. 234). Mind qualities suggest that people learn in combinations of dualities: Concrete Sequential (CS), Concrete Random (CR, Abstract Sequential (AS), or Abstract Random (AR).

Kephart (1964) contended that all learning depends upon proper motor development. Thus, he presented his theory of a sensory-motor basis for all learning. At the some time, Frostig and Horne (1964) became intrigued by perceptual development. Frostig's program remediated any disturbances of a child's perceptual abilities—either the child's visual, auditory, or kinesthetic perception.

Wepman (1964) added his modality concept to the research of the perceptual basis for learning. He felt that the central focus should be on the child, not the method. According to Wepman, a child's learning style—one's maximal modality or pathway of learning, one's differential ability to learn by eye, by ear, or even by touch, must be understood before a particular approach to learning can be determined.

Dunn and Dunn (1975, 1978, & 1979) conducted much research acknowledging the need to identify student learning styles. In 1967, the New York State Department of Education created a program in which the Dunns were employed to train effective teachers for underachieving youngsters in public schools. Through extensive observations, interviews, and experimental studies, the Dunns recognized the extent of individual differences among the students. Continuing research since then has corroborated the belief that significant improvement in achievement, discipline, and motivation occurs when the learning styles of students are matched with complementary teaching styles or instructional methods.

Keefe (1982) shared with educators a definition for conceptualizing learning styles that may be helpful in studying the various instruments available for learning styles assessment. Keefe described learning styles as being "cognitive, affective, and physiological traits that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment" (p. 44). For the purpose of this study, Keefe's (1982) definition of learning styles has been adopted.

For many years, our nation's schools have been in the midst of controversial issues concerning accountability and individualization. As a result, reading instruction begins earlier and continues longer. Large sums of money have been spent on developmental and remedial reading programs and special education programs (Copenhaver, 1979). Approximately 25% of all

students experience reading difficulties (Kintsch, 1979). As many as 20% of all American 17-year-olds were identified as being functionally illiterate in 1975 (Lerner, 1981). These students have consistently failed to learn to read (Maeroff, 1982).

The inability of some teachers to teach reading effectively and be successful in producing a high number of good readers is not a new problem. Why Johnny Can't Read (Flesch, 1955) was the focus of national attention in 1955. Twenty-eight years later, A Nation at Risk (1978), a highly publicized monograph, also focused on problems related to effective teaching methods and student achievement. Teachers have been striving to improve the reading abilities of students for decades. Despite massive federal funding, both past and present reading programs have produced a number of poor readers (Hart, 1983).

Anytime only one reading method is used with an entire class of children, there is a possibility that some students will fail to learn to read (Dykstra, 1966). Children must be exposed to opportunities to learn to read through the methods and materials they prefer. Students who experience frustration and struggle to read will probably develop a dislike for reading. "But when children learn to read through their individual learning styles, they have a greater chance of becoming successful readers" (Carbo, 1982b, p. 39). In addition, research has revealed that children whose intelligence quotients fall within the normal range of 90-109 (Wechsler, 1974) can learn to read better and more easily and can retain information longer when taught using approaches that complement their learning styles (Sudzina, 1986).

Findings by Krimsky (1982), Lynch (1981), Pizzo (1982), Shea (1983), White (1980), and Johnson (1987) have revealed that students achieve better when they are taught through their personal preferences, and their preferences are usually their strengths. The research reported by Dunn and Dunn (1974), Hunt (1981), Hyman and Rosoff (1984), Letteri (1984), Stewart (1981), Wheeler (1980), and Fizzell (1984), among others, clearly demonstrated that addressing learning style differences does improve academic achievement. After reviewing the research finding of many studies, educators can conclude that the identification of students' learning styles will increase, especially reading achievement scores, when teachers meet students' needs for preferred learning environments or instructional strategies. Reinchert (1976), developer of the Edmond Learning Style Identification Exercise (ELSIE), wrote:

> The diversity between the learning profiles of individuals now appears to be so much greater than has generally been recognized that many slow learners are "slow" only because they have never had a chance to learn in the way they could have learned. (p. 161)

Dunn and Carbo (1979) found that most classroom teachers cater to students who prefer formal learning environments. These students are self-motivated, persistent, and responsible. They would rather not eat, drink, or move around while learning. They learn best by hearing and seeing.

Many low achievers in reading benefit from classroom conditions that are quite different. They prefer informal learning environments. They are motivated to seek the company and direction of adults or their peers. These students prefer to learn by touch and movement. More importantly, visual and auditory experiences, for these students, do not provide conditions conducive for optimum learning. Although the need for tactile and kinesthetic reading programs clearly exists, few are available today.

The most important instructional breakthrough in recent years involves the identification of students' learning styles and the subsequent matching of appropriate strategies, resources, and learning environments—a diagnostic-prescriptive approach (Carbo, 1982a). A considerable and growing body of research verifies how crucial this diagnostic-prescriptive approach is for teaching students to read (Johnson & Greenbaum, 1980; Restak, 1979).

Purpose of the Study

The purpose of the study was to determine whether or not a statistically significant relationship existed between the learning styles and reading achievement of sixth-grade students in the State of Alabama. Also, attempts were made to determine whether statistically significant relationships existed between the learning styles of students and their gender (female-male), the locations of their schools (urban-rural), and their racial identification (black-white). A battery of four learning style inventories (Gregorc Style Delineator, Hunt Paragraph Completion Method, Renzulli-Smith Learning Style Inventory, and Carbo Reading Style Inventory) were administered to students to determine their learning styles.

Description of Subjects

Four hundred and five sixth-grade students, representing the eight State School Board Districts in Alabama, participated in the study. The intent of the researcher was to select classes possessing a reasonable balance of female-male and black-white students. To ensure the balance, alternate names were selected from the rolls of sixth graders who had been identified as being prospective female, male, black, or white participants. For each school, a total of 13 participants was selected from each of the four categories. The total school population for the selected schools ranged from 1,100 to 601 students, and the total class population for the sixth-grade classes ranged from 57 to 289 students. The percentages of black and white participants in the study ranged from being 60% black and 40% white to 19% black and 81% white. However, the general statistic for the study revealed that 47.9% of the students were black, and 52.1% were white. Also, the selection of schools based on their affiliation with county or city systems provided a balance of urban and rural students. The general statistic for the study revealed that 46.5% of the students were urban, and 53.5% of the students were rural.

Description of the Instruments

For this study, four learning style inventories were selected that addressed the cognitive, affective, and physiological aspects of learning. The inventories selected included the Gregorc Style Delineator, the Hunt Paragraph Completion Method, the Renzulli-Smith Learning Style Inventory, and the Carbo Reading Style Inventory.

A number of researchers have developed bi-dimensional models of learning styles by combining two information-processing dimensions. The Gregorc Style Delineator is a short self-report inventory, consisting of 40 words in 10 sets of 4 words each. In completing the Gregorc inventory, students rank personal impressions of the words in each set, and they identify their spontaneous, natural ways of interacting with the learning environment (Gregorc, 1982).

Gregroc's Style Delineator evaluates concrete vs. abstract and random vs. sequential learning styles. A profile for learners of four distinct learning

patterns is presented: Concrete Sequential (CS), Concrete Random (CR), Abstract Sequential (AS), and Abstract Random (AR). Each style has its own very special set of characteristics. Concrete Sequential learners are patient, instinctive, methodical, deliberate, and conservative realists. Abstract Sequential learners are logical, analytical, rational, and serious intellectual realists. Abstract Random learners are characterized as psychic, perceptive, critical, and emotional exuberant idealists. Concrete Random learners are implusive, instinctive, intuitive, and inquisitive, independent realists. All learners possess some of the characteristics of each style, yet most have natural dominant styles (Gregorc, 1979). Ninety percent of those tested have a definite preference in one or two of the four categories (Gregorc, 1979).

Conceptual level is a motivational trait created by David Hunt (1979) at the Ontario Institute for the Study of Education. Conceptual level (CL) describes the degree of structure a person needs to learn effectively. Low CL signifies a need for high structure, high CL means that a learner needs less structure. Students typically develop through unsocialized, dependent, and independent stages, requiring less structure and increasing self-expression and autonomy (Hunt, 1979).

Hunt's Paragraph Completion Method (PCM) uses a "semi-projective method to assess Conceptual Level" (Oklahoma State Department of education, 1983, p. 46). Students are given incomplete statements and are asked to write at least three sentences about each, reflecting how they feel about the topic. The topics include the following:

1. What I think about the rules...
2. When I am criticized...
3. What I think about parents...
4. When someone does not agree with me...
5. When I am not sure...
6. When I am told what to do...

The topics were chosen to reveal how students handle conflict. Completion responses are considered to be thought samples and are scored on a scale of 0-3 in terms of their conceptual complexity and personal maturities.

Renzulli and Smith's (1978) approach to the assessment and educational use of learning styles was guided by an operational definition that considers learning styles to be the counterpart of teaching styles. That is, "Learning styles are defined in terms of the range of instructional strategies through which students typically pursue the act of learning" (p.4).

An important part of Renzulli and Smith's goal was to remove some of the mystery that surrounds the assessment of learning styles by dealing with instructional practices rather than the psychological middleman that often characterizes measuring instruments of this type. The Learning Style Inventory (LSI) yields scores that can be translated directly into individualized programming practices, and thus is no need for teachers to second guess how certain psychological concepts or characteristics might be used in a learning situation (Renzulli & Smith, 1978). The number of items composing each factor (projects, drill and recitation, peer teaching, discussion, teaching games, independent study, programmed instruction, lecture, and simulation) and alpha internal consistency reliabilities were calculated.

The identification of individual learning styles has been an important educational breakthrough. Carbo (1980) realized that the subsequent matching

of complementary strategies, resources, and environments was crucial for teaching children to read. Therefore, she developed an inventory to identify children's "reading styles," which are "an individual's specific strengths and requirements when reading" (Carbo [cited in Learner in the Process, 1986, p. 2]).

The Reading Style Inventory (RSI) is a multiple-choice, 52-item questionnaire that identifies youngsters' individual reading style preferences. Most students are accustomed to tests with right and wrong answers. But any answer selected on the RSI is correct if it is a true statement regarding likes, dislikes, or preferences of youngsters while reading. The RSI may be administered to large groups, small groups, or to individuals. There is no limit for administering the Reading Style Inventory. One or more sittings may be required depending on students' attention spans. Identification of reading styles with the RSI can help educators select and design appropriate materials, equipment, and learning environments for children. An individual profile of students' reading styles is derived from students' responses to the Reading Style Inventory. Academic skills are not measured nor are the underlying psychological factors that may or may not cause behavior. The RSI is based on the model of learning styles designed by Dunn, Dunn, and Price (1978) and Carbo (1979).

Hypotheses

Is the reading achievement of students, as measured by the Stanford Achievement Test, significantly related to their learning styles? In order to answer this question, the following primary hypotheses were examined:

Hypothesis 1: No statistically significant relationship exists between the learning styles (abstract random, abstract sequential, concrete random, and concrete sequential) of students as identified by the Gregorc Style Delineator and their Total Reading Achievement scores on the Stanford Achievement Test.

Hypothesis 2: No statistically significant relationship exists between the learning styles (much structure, some structure, less structure, and little structure) of students as identified by the Hunt Paragraph Completion Method and their Total Reading achievement scores on the Stanford Achievement Test.

Hypothesis 3: No statistically significant relationship exists between learning styles (projects, simulation, drill-and-recitation, peer teaching, discussion, teaching games, independent study, programmed study, and lecture) of students as identified by the Renzulli-Smith Learning Style Inventory and their Total Reading achievement scores on the Stanford Achievement Test.

Hypothesis 4: No statistically significant relationship exists between the learning styles (auditory, visual, kinesthetic, and tactile) of students as identified by the Carbo Reading Style Inventory and their Total Reading achievement scores on the Stanford Achievement Test.

In addition to the primary hypotheses that were designed to examine relationships for the participants, three secondary hypotheses were created to examine relationships when the participants were grouped according to gender,

school locations, and racial identification. The secondary hypotheses are as follows:

Hypothesis 5: No statistically significant relationship exists between the learning styles of students as identified by the four learning style inventories (Gregorc Style Delineator, Hunt Paragraph Completion Method, Renzulli-Smith Learning Style Inventory, and Carbo Reading Style Inventory) and their gender (female-male).

Hypothesis 6: No statistically significant relationship exists between the learning styles of students as identified by the four learning style inventories (Gregorc Style Delineator, Hunt Paragraph Completion Method, Renzulli-Smith Learning Style Inventory, and Carbo Reading Style Inventory) and the locations of their schools (urban-rural).

Hypothesis 7: No statistically significant relationship exists between the learning styles of students as identified by the four learning style inventories (Gregorc Style Delineator, Hunt Paragraph Completion Method, Renzulli-Smith Learning Style Inventory, and Carbo Reading Style Inventory) and their racial identification (black-white).

Procedure

The researcher traveled to the selected schools and met with the sixth-grade teachers and students. An informal conversation regarding preferences was conducted with the students. The students were asked to name a favorite season. The number of youngsters who preferred each season was tallied. The results were discussed, and the examiner explained that all of the answers were correct.

When the students appeared to understand the concept of preferences, the idea of selecting a preference from a limited number of choices was introduced. It was explained to the students that they may not find their favorite choices among the given alternatives; however, they were instructed to select the one item they preferred most.

The subjects were administered the Gregorc Style Delineator, the Hunt Paragraph Completion Method, the Renzulli-Smith Learning Style Inventory, and the Carbo Reading Style Inventory. Oral and written directions for each instrument were presented. Ninety minutes of total testing time was needed for the students to complete the four inventories.

The data from each of the four primary hypotheses were analyzed in two different ways. Chi square was used to determine whether or not statistically significant relationships existed between the students' preferences on the learning style inventories (Gregorc Style Delineator, the Hunt Paragraph Completion Method, the Renzulli-Smith Learning Style Inventory, and the Carbo Reading Style Inventory) and their Total Reading scores from the Stanford Achievement Test. In addition, the raw scores from the Stanford Achievement Test for reading were ranked (low to high) in a frequency distribution. The distribution was divided at the 33.3 percentile and at the 66.6 percentile to form low, average, and high categories. Raw scores for reading on the Stanford Achievement Test ranging from 28 to 68 were assigned to Category 1, the low category of reading achievement; scores from 69 to 90 were assigned to Category 2, the average category of reading achievement; and scores ranging from 91 to 176 were assigned to Category 3, the high category of reading achievement. For the null hypotheses that were rejected, the number of scores

in each category were analyzed visually, using the reading categories described above to ascertain the learning style preferences of the students.

Chi square was also used in analyzing the data collected for the three secondary hypotheses, Hypotheses 5, 6, and 7. Attempts were made to determine whether or not statistically significant relationships existed between the learning styles of students and their gender (female-male), the locations of their schools (urban-rural), and their racial identification (black-white). Because chi square is a means of answering questions related to data existing in the form of frequencies (Isaac & Michael, 1985), this technique was selected for use in analyzing the data.

Results

In addressing the seven null hypotheses formulated for the study, 16 analyses were conducted using chi square to determine whether or not statistically significant relationships exist between learning styles with reading achievement, gender (female-male), locations of schools (urban-rural), and racial identification (black-white). In this section, each hypothesis is addressed individually, and the findings for each are presented. Also, for the hypotheses that were rejected, the number of scores in each reading achievement category were analyzed visually to ascertain the learning style preferences of the students. The .01 level of significance was employed in analyzing each hypothesis.

As mentioned earlier, the Total Reading raw scores from the Stanford Achievement Test were ranked (low to high) in a frequency distribution. The distribution was divided at the 33.3 percentile and at the 66.6 percentile to form low, average, and high reading achievement categories. The frequency distribution of achievement scores and the cut-off levels are presented in Table 1.

Null Hypotheses 1 through 4 were addressed first. These hypotheses dealt with the relationships between learning styles as identified by the Gregorc Style Delineator, the Hunt Paragraph Completion Method, the Renzulli-Smith Learning Style Inventory, and the Carbo Reading Style Inventory and reading achievement as measured by the Stanford Achievement Test.

Table 2, Learning Styles and Reading Achievement, presents the data used to analyze Hypothesis 1 addressing the relationship between the learning styles of students as identified by the Gregorc Style Delineator and their Total Reading achievement scores on the Stanford Achievement Test. A chi-square value of 7.03 was acquired. However, a value of 16.81 was required for significance with 6 degree of freedom at the $p \leq .01$ level. The analysis reveals that no statistically significant relationship exists. Therefore, the null hypothesis was not rejected.

Table 2 presents the data used to analyze Hypothesis 2 addressing the relationship between learning styles of students as identified by the Hunt Paragraph Completion Method and their Total Reading achievement scores on the Stanford Achievement Test. A chi square value of 42.83 was acquired, and a value of 16.81 was required for significance with 6 degrees of freedom at the $p < .01$ level. The analysis reveals that a statistically significant relationship exists. Therefore, the null hypothesis was rejected.

In addition to ascertaining that a statistically significant relationship exists for Hypothesis 2, the observed and expected number of responses in each category were analyzed visually to determine the learning style preferences of the participants, the cell contribution preferences of the participants, and the cell contributions for each chi-square analysis. An analysis of the

observed responses (much structure—102, some structure—7, less structure—8, and little structure—15) of the students having low reading achievement (See Table 3, Reading Achievement Categories: Observed and Expected Responses for the Hunt Paragraph Completion Method) reveals that they prefer much structure in their learning environments. An analysis of the expected responses (much structure—75.9, some structure—14.7, less structure—12.7, and little structure—28.7) of the students having low reading achievement (see Table 3) reveals that much structure was preferred by fewer students than was expected, and little structure was preferred by fewer students than was expected. No significant chi-square contributions were acquired from cells where students prefer some or less structure in their learning environments.

An analysis of the observed responses (much structure—68, some structure—25, less structure—17, and little structure—27) of the students having average reading achievement (see Table 3) reveals that they also prefer much structure in their learning environments. An analysis of the expected responses (much structure—78.8, some structure—15.2, less structure—13.2, and little structure—29.8) of the students having average reading achievement (see Table 3) reveals that some structure was preferred by more students than was expected. No significant chi-square contributions were acquired from cells where students prefer much, less, and little structure in their learning environments.

An analysis of the observed responses (much structure—63, some structure—13, less structure—14, and little structure—46) of the students having high reading achievement (see Table 3) reveals that they prefer either much or little structure in their learning environments. An analysis of the expected responses (much structure—78.2, some structure—15.1, less structure—13.1, and little structure—29.6) of the students having high reading achievement (see Table 3) reveals that much structure was preferred by fewer students than was expected, and little structure was preferred by more students than was expected. No significant chi-square contributions were acquired from cells where students prefer some and less structure in their learning environments.

Table 2 presents the data used in analyzing Hypothesis 3 addressing the relationship between the learning styles of students as identified by the Renzulli-Smith Learning Style Inventory and their Total Reading achievement scores on the Stanford Achievement Test. A chi-square value of 30.85 was acquired, and a value of 32.00 was required for significance with 16 degrees of freedom at the $p < .01$ level. The analysis reveals that no statistically significant relationlship exists. Therefore, the null hypothesis was not rejected.

Table 2 presents the data used in analyzing Hypothesis 4 addressing the relationship between the learning styles of students as identified by the Carbo Reading Style Inventory and their Total Reading achievement scores on the Stanford Achievement Test. A chi-square value of 17.38 was acquired, and a value of 16.81 was required for significance with 6 degrees of freedom at the $p \leq .01$ level. The analysis reveals that a statistically significant relationship exists. Therefore, the null hypothesis was rejected.

In addition to ascertaining that a statistically significant relationship exists for Hypothesis 4, the observed and expected number of responses in each category were analyzed visually to determine the learning style preferences of the participants and the cell contributions for each chi-square analysis. An analysis of the observed responses (auditory—44, visual—16, kinesthetic—50, and tactile—22) of the students having low reading achievement (see Table 4,

Reading Achievement Categories: Observed and Expected Responses for the Carbo Reading Style Inventory) reveals that they prefer auditory and kinesthetic learning experiences as opposed to tactile and visual learning experiences. An analysis of the expected responses (auditory—49.5, visual—24.1, kinesthetic—44.5, and tactile—14.0) of the students having low reading achievement (see Table 4) reveals that visual learning experiences were preferred by fewer students than was expected, and tactile learning experiences were preferred by more students than was expected. No significant chi-square contributions were acquired from cells where students prefer auditory and kinesthetic experiences.

An analysis of the observed responses (auditory—52, visual—24, kinesthetic—47, and tactile—14) of the students having average reading achievement (see Table 4) reveals that they prefer auditory and kinesthetic learning experiences as opposed to visual and tactile learning experiences. An analysis of the expected responses (auditory—51.4, visual—25.0, kinesthetic—46.0, and tactile—14.5) of the students having average reading achievement (see Table 4) reveals that students prefer learning experiences as anticipated. No significant chi-square contributions were acquired from cells where students prefer auditory and kinesthetic learning experiences.

In analyzing the data for Hypothesis 5, four sub-hypotheses (5-A, 5-B, 5-C, and 5-D) were addressed. Table 5, Learning Styles and Gender (Female-Male), presents the analysis of the relationship between the learning styles of students and their gender (female-male).

For Sub-hypothesis 5-A, analyzing the relationship between the learning styles of students, as identified by the Gregorc Style Delineator and their gender (female-male), a chi-square value of 7.12 was acquired. However, a value of 11.34 was required for significance with 3 degree of freedom at the $p \leq .01$ level (see Table 5). The analysis reveals that no statistically significant relationship exists. Therefore, this sub-hypothesis was not rejected.

For Sub-hypothesis 5-B, analyzing the relationship between the learning styles of students, as identified by the Hunt Paragraph Completion Method and their gender (female-male), a chi-square value of 2.41 was acquired. However, a value of 11.34 was required for significance with 3 degrees of freedom at the $p \leq .01$ level (see Table 5). The analysis reveals that no statistically significant relationship exists. Therefore, this sub-hypothesis was not rejected.

For Sub-hypothesis 5-C, analyzing the relationship between the learning styles of students, as identified by the Renzulli-Smith Learning Style Inventory and their gender (female-male), a chi-square value of 10.31 was acquired. However, a value of 20.09 was required for significance with 8 degrees of freedom at the $p \leq .01$ level (see Table 5). The analysis reveals that no statistically significant relationship exists. Therefore, this sub-hypothesis was not rejected.

For Sub-hypothesis 5-D, analyzing the relationship between the learning styles of students, as identified by the Carbo Reading Style Inventory and their gender (female-male), a chi-square value of 5.89 was acquired. However, a value of 11.34 was required for significance with 3 degrees of freedom at the $p \leq .01$ level (see Table 5). The analysis reveals that no statistically significant relationship exists. Therefore, this sub-hypothesis was not rejected.

In analyzing the data for Hypothesis 6, four sub-hypotheses, (6-A, 6-B, 6-C, and 6-D) were addressed. Table 6, Learning Styles and Locations of Schools (urban-rural) presents the data used in analyzing the relationships

between the learning styles of students as identified by the learning style inventories and the location of their schools (urban-rural).

For Sub-hypothesis 6-A, analyzing the relationship between the learning styles of students, as identified by the Gregorc Style Delineator and the location of their schools (urban-rural), a chi-square value of 2.48 was acquired. However, a value of 11.34 was required for significance with 3 degrees of freedom at the $p \leq .01$ level (see Table 6). The analysis reveals that no statistically significant relationship exists. Therefore, this sub-hypothesis was not rejected.

For Sub-hypothesis 6-B, analyzing the relationship between the learning styles of students, as identified by the Hunt Paragraph Completion Method and the location of their schools (urban-rural), a chi-square value of 59.17 was acquired, and a value of 11.34 was required for significance with 3 degrees of freedom at the $p \leq .01$ level (see Table 6). The analysis reveals that a statistically significant relationship exists. Therefore, this sub-hypothesis was rejected.

In addition to ascertaining that a statistically significant relationship exists for Sub-hypothesis 6-B, the observed number of responses in each category (see Table 7, Locations of Schools: Observed and Expected Responses for the Hunt Paragraph Completion Method) was analyzed visually to determine the learning style preferences of the urban-rural participants, and the cell contributions for each chi-square analysis. An analysis of the observed responses (much structure--77, some structure--20, less structure--21, and little structure--71) of the students attending urban schools reveals that they prefer either much or little structure as opposed to some and less structure in their learning environments. An analysis of the expected responses (much structure--108.7, some structure--21.0, less structure--18.2, and little structure--41.1) of students attending urban schools (see Table 7) reveals that much structure was preferred by fewer students than was expected, and little structure was preferred by more students than was expected. No significant chi-square contributions were acquired from cells where students attending urban schools prefer some or less structure in their learning environments.

An analysis of the observed responses (much structure--156, some structure--25, less structure--18, and little structure--17) of the students attending rural schools reveals that they prefer much structure as opposed to some, less, and little structure in their learning environments. An analysis of the expected responses (much structure--124.3, some structure--24.0, less structure--20.8, and little structure--46.9) of students attending rural schools (see Table 7) reveals that much structure was preferred by fewer students than was expected. No significant chi-square contributions were acquired from cells where students attending rural schools prefer some or less structure in their learning environments.

For Sub-hypothesis 6-C, analyzing the relationship between the learning styles of students, as identified by the Renzulli-Smith Learning Style Inventory and the location of their schools (urban-rural), a chi-square value of 15.60 was acquired. However, a value of 20.09 was required for significance with 8 degrees of freedom at the $p \leq .01$ level (see Table 6). The analysis reveals that no statistically significant relationship exists. Therefore, this sub-hypothesis was not rejected.

For Sub-hypothesis 6-D, analyzing the relationship between the learning styles of students, as identified by Carbo Reading Style Inventory and the location of their schools (urban-rural), a chi-square value of 10.61 was acquired. However, a value of 11.34 was required for significance with 3

degree of freedom at the $p \leq .01$ level. The analysis reveals that no statistically significant relationship exists. Therefore, this sub-hypothesis was not rejected (see Table 7).

In analyzing the data for Hypothesis 7, four sub-hypotheses (7-A, 7-B, 7-C, and 7-D) were addressed. Table 8, Learning Styles and Racial Identification (Black-White), presents the data used in analyzing the relationships between learning styles of students as identified by the four learning style inventories and their racial identification (black-white). For Sub-hypothesis 7-A, analyzing the relationship between the learning styles of students as identified by the Gregorc Style Delineator and their racial identification (black-white), a chi-square value of 1.26 was acquired. However, a value of 11.34 was required for significance with 3 degrees of freedom at the $p \leq .01$ level (see Table 8). The analysis reveals that no statistically significant relationship exists. Therefore, this sub-hypothesis was not rejected.

For Sub-hypothesis 7-B, analyzing the relationship between the learning styles of students as identified by the Hunt Paragraph Completion Method and their racial identification (black-white), a chi-square value of 19.89 was acquired, and a value of 11.34 was required for significance with 3 degrees of freedom at the $p \leq .01$ level (see Table 8). The analysis reveals that a statistically significant relationship exists. Therefore, this sub-hypothesis was rejected.

In addition to ascertaining that a statistically significant relationship exists for Sub-hypothesis 7-B, the observed number of responses in each category (see Table 9, Racial identification: Observed and Expected Responses for the Hunt Paragraph Completion Method) was analyzed visually to determine the learning style preferences of the black-white participants and the cell contributions for each chi-square analysis. An analysis of the observed responses (much structure—97, some structure—33, less structure—25, and little structure—39) of the black students reveals that they prefer much structure as opposed to some, less, and little structure in their learning environments. An analysis of the expected responses (much structure—111.6, some structure—21.6, less structure—18.7, and little structure—42.2) of the black students (see Table 9) reveals that some structure was preferred by more students than was expected. No significant chi-square contributions were acquired from cells where black students prefer much, less, and little structure in their learning environments.

An analysis of the observed responses (much structure—136, some structure—12, less structure—14, and little structure—49) of the white students reveals that they also prefer much structure as opposed to some, less, and little structure in their learning environments. An analysis of the expected responses (much structure—121.4, some structure—23.4, less structure 20.3, and little structure—45.8) of the white students (see Table 9) reveals that some structure was preferred by fewer students than was expected. No significant chi-square contributions were acquired from cells where white students prefer much, some, and little structure in their learning environments.

For Sub-hypothesis 7-C, analyzing the relationship between the learning styles of students as identified by the Renzulli-Smith Learning Style Inventory and their racial identification (black-white), a chi-square value of 10.48 was acquired. However, a value of 20.09 was required for significance with 8 degrees of freedom at the $p \leq .01$ level (see Table 8). The analysis reveals that no statistically significant relationship exists. Therefore, this sub-hypothesis was not rejected.

For Sub-hypothesis 7-D, analyzing the relationship between the learning styles of students as identified by the Carbo Reading Style Inventory and their racial identification (black-white), a chi-square value of 3.96 was acquired. However, a value of 11.34 was required for significance with 3 degrees of freedom at the $p \leq .01$ level (see Table 8). The analysis reveals that no statistically significant relationship exists. Therefore, this sub-hypothesis was not rejected.

Discussion

This study produced evidence supporting the following conclusions:

1. In analyzing Hypothesis 1, it was noted that no statistically significant relationship existed between the learning styles of students as identified by the Gregorc Style Delineator and their Total Reading achievement scores on the Stanford Achievement Test. It is concluded, therefore, that the Gregorc Style Delineator would not be useful in making decisions concerning the types of reading instruction or materials appropriate for use with sixth-grade students in the State of Alabama.

2. In analyzing Hypothesis 2, it was noted that a statistically significant relationship existed between the learning styles of students as identified by the Hunt Paragraph Completion Method and their Total Reading achievement scores on the Stanford Achievement Test. It is concluded, therefore, that the Hunt Paragraph Completion Method would be useful in making decisions concerning the types of reading instruction or materials appropriate for use with sixth-grade students in the State of Alabama.

In addition, a visual analysis of the responses revealed that the students having low and average reading achievement preferred much structure, and the students having high reading achievement preferred either much or little structure. It is concluded, therefore, that the Hunt Paragraph Completion Method would be useful in identifying learning style preferences for sixth-grade students in Alabama with low, average, and high reading achievement who prefer much or little structure in their learning environments.

3. In analyzing Hypothesis 3, it was noted that no statistically significant relationship existed between the learning styles of students as identified by the Renzulli-Smith Learning Style Inventory and their Total Reading achievement scores on the Stanford Achievement Test. It is concluded, therefore, that the Renzulli-Smith Learning Style Inventory would not be useful in making decisions concerning the types of reading instruction or materials appropriate for use with sixth-grade students in the State of Alabama.

4. In analyzing Hypothesis 4, it was not that a statistically significant relationship existed between learning styles of students as identified by the Carbo Reading Style Inventory and their Total Reading achievement scores on the Stanford Achievement Test. It is concluded, therefore, that the Carbo Reading Style Inventory would be useful in making decisions concerning the types of reading instruction or materials appropriate for use with sixth-grade students in the State of Alabama.

In addition, a visual analysis of the scores revealed that the students having low, average, and high reading achievement preferred kinesthetic and auditory learning experiences as opposed to visual and tactile learning experiences. It is concluded, therefore, that the Carbo Reading Style Inventory would be useful in identifying learning style preferences for

sixth-grade students in Alabama with low, average, and high reading achievement who prefer kinesthetic or auditory learning styles.

5. To analyze Hypothesis 5, four sub-hypotheses, 5-A, 5-B, 5-C, and 5-D, were addressed. In analyzing the sub-hypotheses, it was noted that no statistically significant relationships existed between the learning styles of students as identified by the four learning style inventories (Gregorc Style Delineator, 5-A; Hunt Paragraph Completion Method, 5-B; Renzulli-Smith Learning Style Inventory, 5-C; and Carbo Reading Style Inventory, 5-D) and their gender (female-male). It is concluded, therefore, that the four learning style inventories administered in the study would not be useful in identifying learning style preferences for female or male sixth-grade students in the State of Alabama.

6. To analyze Hypothesis 6, four sub-hypotheses, 6-A, 6-B, 6-C, and 6-D, were addressed. In analyzing the sub-hypotheses, it was noted that no statistically significant relationship existed between the learning styles of students as identified by the Gregorc Style Delineator, 6-A; the Renzulli-Smith Learning Style Inventory, 6-C; or the Carbo Reading Style Inventory, 6-D, and the location of their schools (urban-rural). It is concluded, therefore, that these inventories would not be useful in identifying learning style preferences for sixth-grade students in Alabama attending urban or rural schools.

However, in analyzing Sub-hypothesis 6-B, it was noted that a statistically significant relationship existed between the learning styles of students as identified by the Hunt Paragraph Completion Method and the locations of their schools (urban-rural). In addition, analysis of the observed responses used in calculating the chi square for the Hunt Paragraph Completion Method and locations of schools (Sub-hypothesis 6-B) revealed that students attending urban and rural schools preferred much structure as opposed to little structure in their learning environments. Therefore, it is concluded that the Hunt Paragraph Completion Method would be useful in identifying the learning styles of sixth-grade students in Alabama attending urban and rural school who prefer much structure in their learning environments.

7. To analyze Hypothesis 7, four sub-hypotheses, 7-A, 7-B, 7-C, and 7-D, were addressed. In analyzing the sub-hypotheses, it was not that no statistically significant relationship existed between the learning styles of students as identified by the Gregorc Style Delineator, 7-A, Renzulli-Smith Learning Style Inventory, 7-C, or the Carbo Reading Style Inventory, 7-D, and their racial identification (black-white). It is concluded, therefore, that these inventories would not be useful in identifying learning style preferences of black or white sixth-grade students in Alabama.

However, in analyzing Sub-hypothesis 7-B, it was noted that a statistically significant relationship existed between the learning styles of students as identified by the Hunt Paragraph Completion Method. In addition, an analysis of the obesrved responses used in calculating the chi square for the Hunt Paragraph Completion Method, 7-B, and their racial identification (black-white) revealed that the black and white students had a greater preference for much structure as opposed to some, less, or little structure. Therefore, it is concluded, that the Hunt Paragraph Completion Method would be useful in identifying black and white sixth-grade students in the State of Alabama who prefer much structure in their learning environments.

Table 1

Frequency Distribution for Reading Achievement Scores

Stanford Achievement categories	Range of raw scores	Percentage of cases
1	28- 68	32.6
2	69- 90	33.8
3	91-176	33.6

Table 2

Learning Styles and Reading Achievement

Hypothesis	Relationship	df	X^2	Probability
1	Gregorc Style Delineator and reading achievement	6	7.03	0.318
2	Hunt Paragraph Completion Method and reading achievement	6	42.83	0.001*
3	Renzulli-Smith Learning Style Inventory and reading achievement	16	30.85	0.014
4	Carbo Reading Style Inventory and reading reading achievement	6	17.38	0.008*

Note. A chi square of 16.81 is required for significance with 6 degrees of freedom at the $p \leq .01$ level. A chi square of 32.00 is required for significance with 16 degrees of freedom at the $p \leq .01$ level.

*Significant at the $p \leq .01$ level.

Table 3

Reading Achievement Categories: Observed and Expected Responses for the Hunt Paragraph Completion Method

Category	Response	Much structure	Some structure	Less structure	Little structure	Total responses
1--Low reading achievement	Observed	102	7	8	15	132
	Expected	75.9	14.7	12.7	28.7	
	Cell chi-square	8.94	4.00	1.75	6.52	
2--Average reading achievement	Observed	60	25	17	27	137
	Expected	78.8	15.2	13.2	29.8	
	Cell chi-square	1.48	6.28	1.10	.26	
3--High reading achievement	Observed	63	13	14	46	136
	Expected	78.2	15.1	13.1	29.6	
	Cell chi-square	2.97	.29	0.06	9.16	
Total responses		233	45	39	88	405
Total chi-square		42.83				

Note. A chi-square of 16.81 is required for significance with 6 degrees of freedom at the $p \leq .01$ level.

Table 4

Reading Achievement Categories: Observed and Expected Responses for the Carbo Reading Style Inventory

Category	Response	Auditory	Visual	Kinesthetic	Tactile	Total responses
1--Low reading achievement	Observed	44	16	50	22	132
	Expected	49.5	24.1	44.3	14.0	
	Cell chi-square	0.62	2.73	.73	4.54	
2--Average reading achievement	Observed	52	24	47	14	137
	Expected	51.4	25.0	46.0	14.5	
	Cell chi-square	0.01	.04	.02	.02	
3--High reading achievement	Observed	56	34	39	7	136
	Expected	51.0	24.8	45.7	14.4	
	Cell chi-square	.49	3.37	.98	3.83	
Total responses		152	74	136	43	405
Total chi-square		17.38				

Note. A chi-square of 16.81 is required for significance with 6 degrees of freedom at the $p \leq .01$ level.

Table 5

Learning Styles and Gender (Female-Male)

Hypothesis	Relationship	df	X^2	Probability
5-A	Gregorc Style Delineator and gender	3	7.12	0.068
5-B	Hunt Paragraph Completion Method and gender	3	2.41	0.491
5-C	Renzulli-Smith Learning Style Inventory and gender	8	10.31	0.244
5-D	Carbo Reading Style Inventory and gender	3	5.89	0.117

Note. A chi square of 11.34 is required for significance with 3 degrees of freedom at the $p \leq .01$ level. A chi square of 20.09 is required for significance with 8 degrees of freedom at the $p \leq .01$ level.

Table 6

Learning Styles and Locations of Schools (Urban-Rural)

Hypothesis	Relationship	df	X^2	Probability
6-A	Gregorc Style Delineator and urban/rural	3	2.48	0.479
6-B	Hunt Paragraph Completion Method and urban/rural	3	59.17	0.001*
6-C	Renzulli-Smith Learning Style Inventory and urban/rural	8	15.60	0.048
6-D	Carbo Reading Style Inventory and urban/rural	3	10.61	0.014

Note. A chi square of 11.34 is required for significance with 3 degrees of freedom at the $p \leq .01$ level. A chi square of 20.09 is required for significance with 8 degrees of freedom at the $p \leq .01$ level.

*Significant at the $p \leq .01$ level

Table 7

Locations of Schools: Observed and Expected Responses for the Hunt Paragraph Completion Method

Category	Response	Much structure	Some structure	Less structure	Little structure	Total responses
Urban	Observed	77	20	21	71	189
	Expected	108.7	21.0	18.2	41.1	
	Cell chi-square	9.27	.05	.43	21.81	
Rural	Observed	156	25	18	17	216
	Expected	124.3	24.0	20.8	46.9	
	Cell chi-square	8.10	.04	.38	19.09	
Total responses		233	45	39	88	405
Total chi-square		59.17				

Note. A chi-square of 11.34 is required for significance with 3 degrees of freedom at the $p \leq .01$ level.

Table 8

Learning Styles and Racial Identification (Black-White)

Hypothesis	Relationship	df	X^2	Probability
7-A	Gregorc Style Delineator and racial identification	3	1.26	0.740
7-B	Hunt Paragraph Completion Method and racial identification	3	19.89	0.001*
7-C	Renzulli-Smith Learning Style Inventory and racial identification	8	10.48	0.233
7-D	Carbo Reading Style Inventory racial identification	3	3.96	0.265

Note. A chi square of 11.34 is required for significance with 3 degrees of freedom at the $p \leq .01$ level. A chi square of 20.09 is required for significance with 8 degrees of freedom at the $p \leq .01$ level.

*Significant at the $p \leq .01$ level.

Table 9

Racial Identification: Observed and Expected Responses for the Hunt Paragraph Completion Method

Racial identification	Response	Much structure	Some structure	Less structure	Little structure	Total responses
Black	Observed	97	33	25	39	194
	Expected	111.6	21.6	18.7	42.2	
	Cell chi-square	1.91	6.07	2.13	.23	
White	Observed	136	12	14	49	211
	Expected	121.4	23.4	20.3	45.8	
	Cell chi-square	1.76	5.59	1.97	.22	
Total responses		233	45	39	88	405
Total chi-square		19.89				

Note. A chi-square of 11.34 is required for significance with 3 degrees of freedom at the $p \leq .01$ level.

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